

## ABSTRACTS

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### A NEW METHOD FOR CLIMBING RAIN FOREST TREES USING DOUBLE ROPE LOOPS

Obtaining botanical specimens from tropical forest canopies is a perennial problem for tropical biologists. Vertical rope-climbing methods require considerable time and exertion to get the rope up over a safe support. Collecting from a swinging rope is not very convenient. A new method has been devised suitable for ascending straight trees in the 10–30 cm dbh range, which uses rope loops attached to foot and waist assemblies that pass twice around the tree trunk. An additional safety rope attached to a chest harness passes once around the tree. Ascending the tree is easy and safe, though not too rapid. One can usually ascend to heights of 10–25 m from which one can reach specimens with a pole with cutting device. The climber, securely fastened to the trunk, has both hands completely free and can manipulate a pole with ease. About US\$200–300 worth of technical climbing gear is required.

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### A MULTIPLE SCALE STUDY OF SEASONAL VARIATION IN CANOPY LEAF DENSITY IN THE AMAZON BASIN USING REMOTE SENSING

Seasonal changes in leaf density are difficult to determine on a stand level in tropical areas because of the variety of phenological patterns displayed by individual tree species, high species diversity, and limited synchrony among individuals. Satellite images, because of their coarse spatial scale and frequent temporal sampling, can provide a way to look at seasonal and annual changes in the canopy from a perspective that integrates individual trees. Use of satellite images in tropical areas is hampered by seasonally high cloud and smoke cover which can be difficult to separate from vegetation signals. We used satellite images, aerial photographs and field data on multiple temporal and spatial scales to examine seasonal changes in leaf density in the forests around Manaus and Amazonas, Brazil. The widely-used Normalized Difference Vegetation Index (NDVI) taken from coarse-resolution Advanced Very High Resolution Radiometer (AVHRR) images appears to be a poor indicator of seasonality in terra firma forest because of seasonally high atmospheric inputs and the difficulty of separating the effects of vegetation and atmosphere in NDVI measurements. Finer-resolution Thematic Mapper (TM) images, analyzed with a spectral mixing model that decomposes the satellite information into fractions of materials that compose a canopy (green foliage, bark, and shade/shadows), offer the best current possibility of detecting subtle seasonal changes in leaf density.

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### CORRELATION BETWEEN SIZE CLASSES OF ANTS *Formica polyctena* AND SEEDS ON MYREMEOCHOROUS PLANTS OF DECIDUOUS FOREST (CENTRAL UKRAINE, EAST EUROPE)

Our previous investigations showed that seeds of five myrmecochorous plant species, *Chelidonium majus* L. (CHE), *Viola matutina* Klok. (MAT), *V. mirabilis* L. (MIR), *V. hirta* L. (HIR), and *Asarum europaeum* L. (ASA), had different rates of removal by the ant, *Formica polyctena*. It was hypothesized that (1) different size classes (SC) of ants prefer seeds of certain species that differ in size and design of the seeds; and (2) large-sized ants lose the small seeds of MAT and CHE more often, and

small-sized ants lose the large seeds ASA, HIR, and MIR more often. To examine these hypotheses, mark-recapture experiments were used. The head width of the ants that removed and transferred seeds for a distance of 3 m was measured.

A comparison of histograms of head size (SDH) of ants removing seeds of each plant species vs. SDH of causally captured foraging individuals shows: 1) SDH of causally selected individuals has twin peaks according to two main SC; 2) in cases of the middle (MIR) and the small seeds (MAT and CHE), the second peak was muted, because large ants seldom remove seeds of these species. For small seeds (MAT and CHE), SDH was shifted to the side of small ant individuals and peaks in the region of the small SC appeared and 3) for large seeds (ASA and HIR), the second peak remained.

SDH of individuals that took the seeds vs. individuals that transferred the seeds for a distance of 3 m was almost identical, both for HIR and MIR. These seeds lost were by ants of different SC with the same frequency. In contrast, in the experiments with ASA, the peak of SDH for ants that transferred the seeds was skewed toward larger SC, if compared with SDH for ants that only took the seeds. Therefore, small ants lose ASA seeds more often, as compared with large ants.

It may be suggested that, in the habitats with populations of *F. polycetena*, small individuals will be small-seed myrmecochors (CHE, MAT), and in habitats with prevalence of large SC of ants, large-seed myrmecochors (ASA, HIR) will be most common.

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#### SURUMONI PROJECT—TOWARDS AN UNDERSTANDING OF THE STRUCTURE AND FUNCTION OF A NEOTROPICAL RAIN FOREST ECOSYSTEM WITH SPECIAL REFERENCE TO ITS CANOPY

An interdisciplinary long-term project (at least 5 years; beginning 1995) has been initiated by the Austrian Academy of Sciences and coordinated with CAIAH, SADA-AMAZONAS and FUNDACION TERRAMAR (Venezuela). The study area, a terra firma forest (canopy height about 30 m), is located in southern Venezuela near the Surumoni, a tributary of the upper Orinoco river next to La Esmeralda. The spatial structure of a forest plot will be mapped and processed with a GIS program, and monitored over a long time period. These data will serve as the basis for investigations of plant and animal communities (forest dynamics, habitat use, bioacoustics, sensory ecology, plant-animal interactions). Complementary studies of abiotic factors (microclimate, soils, nutrient cycles and energy-flow) are planned. The access tool, a 36 m tall construction crane with a 40 m long jib, will run a 120 m railroad track (gauge 3.8 m) and cover an area of 1.45 ha. Six groups of scientists from Austria, Venezuela and Germany will be involved in the investigations.

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#### REPRODUCTIVE CHARACTERISTICS OF TWO AMAZONIAN RAIN FOREST COMMUNITIES. A STUDY AT CANOPY LEVEL

Most studies concerning pollination and seed dispersal concentrate on a single species, genus or family. We still know little about reproductive processes on the scale of whole plant communities, however. The main objective of this investigation is to study the reproductive characteristics of two different forest types at the community level. Flooded forest will be compared with upland non-inundated forest, whereby we concentrate on processes in the canopy. Our preliminary results show that, as far as pollination is concerned, there is little difference between the two vegetation types. Small and large bees are the pollinators of the majority of plants in both vegetations, with all other vectors playing a less important role. Differences are more distinct between the dispersal strategies. In the flooded forest, a relatively large number of plant species rely on wind and water for seed dispersal while animals are much more important as seed dispersers in the non-inundated forest.

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#### FOREST CANOPY MEASUREMENTS AS INPUTS TO TROPICAL FOREST MAPPING FROM REMOTELY SENSED DATA

The differentiation and mapping of humid tropical forest types from remotely sensed data depends on an understanding of radiation-canopy interactions. Essential to such research is forest canopy mapping and characterization. As part of a forest mapping project in South America, we are characterizing evergreen and seasonal forest canopies in Bolivia by measuring tree parameters and taking hemispherical photographs. The canopies are then visualized. The key canopy elements in differentiating forest types appear to be a) gap size and frequency, b) structure, and c) leaf area index.

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#### BRANCH EPIPHYTE ASSEMBLAGES IN THE FOREST INTERIOR AND ON THE CLEAR-CUT EDGE OF A 700-YEAR-OLD DOUGLAS FIR CANOPY IN WESTERN OREGON

A total of 65 epiphyte species (macrolichens and bryophytes) were found on the branches of four 700-year-old Douglas fir trees, two growing in the forest interior and two growing on the edge of a 20-year-old clearcut. The moss *Antrichia curtipendula* and the cyanolichen *Lobaria oregana* dominated the epiphyte assemblages. Branch epiphyte assemblages were similar to those reported for a 450-year-old Douglas fir forest, but *A. curtipendula* and *Pseudocyphellaria rainierensis* were much more abundant in the older forest. Epiphyte species tended to be positively associated with other members of their functional group. Alectoroid and "other" lichens tended to be negatively associated with bryophytes. Several species were closely associated with moss mats. Ordination revealed one dominant gradient in epiphyte composition which was correlated with height and could be partitioned into three microclimatic zones: an exposed upper zone with high lichen cover and low bryophyte cover, a more sheltered lower zone dominated by bryophytes, and an intermediate middle zone. Macrolichen biomass and species richness did not differ between the forest interior and clearcut edge, but there were differences in the vertical distributions of epiphytes. Epiphyte assemblages in the lower portion of tree crowns on the clearcut edge were similar to those found much higher in the trees. A clearer vertical stratification of microclimatic zones was evident in the forest interior.

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#### THE IMPORTANCE OF PTERIDOPHYTES IN THE EPIPHYTIC FLORA OF SOME PHOROPHYTES OF THE CAMEROONIAN SEMI-DECIDUOUS RAIN FOREST

Epiphyte diversity and abundance were surveyed in trees that were felled by a logging operation in the Cameroonian semi-deciduous rain forest to determine the importance of pteridophytes. Six host tree species were surveyed, including 150 individual phorophytes. *Triplochiton scleroxylon* hosted the greatest number of pteridophytes while *Canarium schweinfurthii* and *Terminalia superba* hosted the fewest. Of the 78 epiphytic species recorded, the largest groups were the monocotyledons (51 species) and the pteridophytes (20 species), while the dicotyledons (7 species) were the smallest. Regardless of the host, pteridophytes represented over 25% of the epiphytic flora. More than 5 pteridophytes were always hosted by each of the individual host trees. Within the pteridophytes, Polypodiaceae (8 species) was the most diversified family, followed by Davalliaceae (5 species) and Aspleniaceae (4 species). Factor analysis showed no strict specificity between tree species and pteridophytes.

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FAUNA OF MARSUPIAL POUCHES OF *Scaphopetalum thonneri*

*Scaphopetalum thonneri* (De Wild & Th. Dur.) is an understory Sterculiaceae growing in the tropical rain forests of Zaire, Gabon and Cameroon. In this report, I describe its marsupial pouch fauna. The fauna of marsupial pouches of *Scaphopetalum thonneri* varies with geographic location, and includes both permanent and temporary guests. The role of ants is not yet elucidated in their mutual relations with *Scaphopetalum thonneri*. In the future we shall try to clarify this aspect of the relationship.

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LAYERING OF SOME UNDERSTORY LIGNEOUS PLANTS IN THE TROPICAL RAIN FORESTS OF CAMEROON

Layering is vegetative reproduction observed in many lianas and shrubs in the tropical rain forests of Cameroon. Species that exhibit this phenomenon include members of the families Sterculiaceae and Monimiaceae, particularly those species which form few flowers, fruits and seeds (e.g. *Scaphopetalum thonneri*). I describe layering by pauciflorous understory shrubs as a way to facilitate reproduction. Yet, when the phenomenon is too developed, it disturbs regeneration. Because of the increasing numbers of species that exhibit layering, I think that this process could be an important mechanism in tropical rain forests.